

Remarks

Claims 1- 17 were pending in the application and are under Final Rejection. Claim 4 is amended herewith. Claims 1-17 remain in the application.

Applicants' attorney noticed that dependent claim 4 did not include a proper antecedent for the phrase "the plenum", and has corrected that inadvertent oversight in a manner similar to claim 3. Applicants believe the remaining claims are patentable over all art previously and presently cited by the Examiner in the examination of the application and accordingly, no further amendments have been made thereto.

The earlier arguments contained in the Amendment of Feb. 21, 2006 continue to be applicable with respect to at least the references cited and applied in the initial Office Action of Nov. 22, 2005. Accordingly, those arguments are incorporated herein by reference and will, in most instances, be reiterated for emphasis. Applicants will address the various rejections contained in the Final Rejection in the sequence in which they appeared in that Final Rejection, occasionally referring to the numbered paragraph as "item #" and also to the page of the Office Action on which that item # appears. The Examiner should also note that the following comments rely upon a *Declaration of Attribution Under 37 CFR 1.132*; a *Declaration Under 37 CFR 1.131*; and a *Statement of Common Ownership to Exclude Grasso '505 as 35 USC 103(c) Prior Art*. To the extent they are separate documents, they are submitted herewith, and are identified in the following text via the bold, underlined italics shown above.

Item # 2, Pages 2 & 3

Claims 1 and 11 have been rejected for the first time as clearly anticipated under 35 USC 102(e) by newly cited and newly applied Grasso reference 6,979,505 (hereinafter "Grasso '505"). In order to obviate use of that Grasso '505 reference in a rejection under at least 35 USC 102(e), and any other rejection for which this submission may be appropriate, a *Declaration of Attribution Under 37 CFR 1.132* by Albert Grasso is submitted herewith in a separate document. This submission is deemed timely inasmuch as this is the first time the Grasso '505 reference has been cited/applied herein.

In accordance with MPEP 716.10, Albert Grasso, a joint inventor of the present invention and also a joint inventor of Grasso '505, unequivocally declares that with respect to the disclosure in U. S. Patent 6,979,505 (the reference patent) of the "additional enhancement of that cleansing capability" by the provision of "one or more water injection devices, depicted as spray nozzles 70, typically at or near the inlet end of the WTD 118 for the inlet oxidant 38" (Col 8, lines 12 -19), he is the individual who conceived of that structure/feature/arrangement in the context of that disclosed and claimed invention in the Grasso '505 reference. Accordingly, it is respectfully submitted that the 132 Declaration obviates at least the 102(e) rejection.

As an aside and not believed to bear on effectiveness of the 132 Declaration, the Examiner is advised that although the filing date of the Grasso '505 reference predates that of the present application, the broad idea of using a water injection spray to spray water into an inlet air stream prior to it passing through an ERD (or WTD) may have first occurred in connection with the present invention rather than the Grasso '505 claimed invention. The purposes for which that spray is/are used differ significantly between the two inventions, as will be discussed herein later in greater detail.

Item #5, Pages 4-8

Claims 1-5 and 9-11 have been rejected under 35 USC 103(a) as being unpatentably obvious over Grasso et al 5,274,259 (herein after "Grasso '259") in view of Grasso '505. In fact, with respect to claims 1 and 11, claims 2 and 3, and claims 4 and 5, a first 103 obviousness rejection appears to be based solely on the Grasso '259 reference, much as in the previous office action. A second 103 obviousness rejection then adds the Grasso '505 reference to reject those claims as well as claims 9 and 10 (presumably).

Applicants wish to note the amendment(s) made to claims 1 and 11 in the Amendment(s) dated Feb 21, 2006 (and Supplemental Compliant Amendment of Mar. 17, 2006). The liquid medium (water) is dispensed or injected "**substantially directly**" into the process oxidant stream. Moreover, as those claims previously provided and applicants argued, that injection/dispensing of liquid/water substantially directly into the process oxidant stream occurs "**preparatory to the process oxidant passing through the energy recovery device second gas flow channel ...**".

While the immediately following arguments may be little more than a reiteration of applicants' arguments in this regard contained in the earlier Amendment(s), they are believed to clearly and patentably distinguish the present invention from any disclosure or teaching contained in the Grasso '259 reference. Applicants acknowledge the similarities of the present invention (in claims 1 and 11) as the Examiner has characterized them on pages 4 and the upper half of page 5 of the Apr 3, 2006 Office Action, however applicants respectfully and completely reject and traverse the Examiner's reasoning and application of the Grasso '259 reference as a teaching of the presently claimed invention as expressed by the Examiner at the latter part of page 5 of that Office Action.

As was clearly noted earlier, the Grasso reference was that described at the bottom of page 4 and all of page 5 of the present application in describing the Background art. Note on page 5, lines 29-33 that the liquid transfer medium of the Grasso '259 reference was characterized as "simply ... trapped in the fine pore enthalpy exchange barrier in an adequate amount or, if necessary, may be re-supplied from a supply reservoir". This latter aspect was descriptive of the fluid from reservoir 112 of Grasso '259 being supplied via feed line 116 to the barrier 12. Applicants are, and were, aware of this characteristic of the Grasso '259 reference. Nevertheless, as noted at the top of page 6 of the present application, such provisions may simply not be adequate to prevent certain shortcomings of that prior art in the event of particularly arid and /or hot conditions of the environment. Because any water delivered to the oxidant stream in the Grasso '259 reference must come by way of evaporation through the 0.1 to 100 micron pores of the enthalpy exchange barrier, that delivery is necessarily limited and it is possible for the leading portion of the barrier to dry out and allow gas cross-over if humidity conditions in the entering air are low.

The present invention overcomes the abovementioned shortcomings by introducing a liquid medium, such as water, to the process oxidant stream without the restrictive flow limitations of a fine pore barrier. That liquid medium is dispensed, or injected, substantially directly into the oxidant stream, preferably as or just before the oxidant stream enters the "second gas flow channel" of the "energy recovery device". This arrangement and process is clearly set out in the amended claims 1 and 11 and clearly

differ from, and may be viewed as supplemental to, the provision of water/liquid to the enthalpy exchange barrier that separated the 1st and 2nd gas flow channels in the energy recovery device of the Grasso '259 reference. Indeed, while the present invention assumes the presence of a liquid transfer medium in the fine pore support structure of the enthalpy exchange barrier 46 of ERD 32 to prevent bulk gas flow between the two gas channel and to facilitate transfer of heat and some moisture (mass) between channels (page 11, line 24 to page 13, line 20), it also further provides (page 13, line 21 to page 14, line 4) for the injection of water into the oxidant stream to supplement the moisture from the enthalpy exchange barrier 46.

Moreover, claims 1 and 11 require that the injecting/injection/dispensing of water/liquid occur “preparatory to the process oxidant passing through the energy recovery device second gas flow channel”. This clearly establishes a position/location/sequence of the injection that simply is not disclosed/contemplated/obvious in view of the Grasso '259 reference. A careful reading and understanding of the disclosure contained in the Grasso '259 reference reveals that it does not disclose or suggest the structure and/or function required by claims 1 and 11. As discussed in the Background section of the present application, the initial source of water or other liquid to serve as the transfer liquid in the Grasso '259 reference is the moisture moving out of the fuel cell and steam generator via the exhaust stream 88 through the ERD or WTD 92. Then, as discussed at Col. 8, lines 33 – 51 of the Grasso '259 reference and at Background pages 4 and 5 of the present application, that prior art system may additionally have included a liquid transfer medium supply means 112 for supplying a liquid transfer medium 113 through a conduit 116 to “**the fine pore enthalpy exchange barrier**” (emphasis added) 12. This is the delivery into the enthalpy exchange barrier that applicants discussed in their Background as being supplemental and helpful, but in many instances not adequate because of the limiting characteristics of being forced to evaporate thorough the fine pores. It is this limitation that the invention overcomes, and is accomplished by the supplement of injecting liquid/water “**substantially directly**” into the process oxidant stream “**preparatory to**” that oxidant stream passing through the ERD.

The liquid medium transfer line 116 of the Grasso 359 reference does not inject or dispense water substantially directly into the oxidant stream preparatory to that oxidant stream passing through the ERD, and thus is not a suitable teaching of even the broadest aspects of the inventively novel aspects of the present claimed invention. Rather, line 116 of Grasso '259 delivers that supplemental water substantially directly into the fine pore enthalpy exchange barrier 12, not the oxidant stream 96 and 102. Only then is it available for evaporation at a limited rate into the oxidant stream. Moreover, whereas claims 1 and 11 require the injection or dispensing of the water into the oxidant stream "preparatory to" that oxidant stream passing through, it is clear in Grasso '259 that water entering the oxidant stream by evaporation from the exchange barrier 12 necessarily does so once the oxidant has at least begun to pass over (contact) the exchange barrier within the ERD/WTD 92, not "preparatory to" such occurrence.

While the Examiner seeks to give the Grasso '259 reference the broadest possible construction in attempting to reject the means plus function language of claim 1, it is simply not accurate or permissible to construe or apply that reference in a manner which it does not disclose or teach. Applicants specific language in claims 1 and 11, as well as the limitations that these present arguments necessarily establish by estoppel, clearly set forth a structure and a method that differ from the Grasso '259 reference in an unobvious and patentable manner. The presently claimed invention simply was neither suggested nor considered by any of the disclosure contained in that reference.

On page 6 of the Office Action, the Grasso '259 reference has been further applied to reject claims 2 and 3. Applicants fail to understand the manner in which the Examiner is attempting to construe the "enlarged portion of Fig. 1" that is then discussed. Water may indeed be the transfer medium in line 116, but it is simply never injected "substantially directly" into the oxidant stream "preparatory to" that oxidant stream passing through the ERD. While the Examiner may be permitted to give that figure a construction which it either clearly or reasonably teaches, it is not permissible to give it a construction which it does not teach. If the latter were to be so, it is then possible to redefine it to absurd bounds that are neither supported nor ever intended. The water from feed line 116 may indeed find its way into the oxidant stream within the ERD 92 as the result of an evaporative process via the small, flow-limiting pores of the barrier 12 (not "substantially

directly”) and it is within the chamber 102 of ERD 92 (not “preparatory to”, ie. before, the oxidant enters the ERD). Neither the disclosure of Grasso ‘259 nor the actual operation of it (Mr. A. Grasso is an inventor of the present invention as well as the 2 cited references) support the construction which the Examiner seeks to give it. The Examiner “contends” that the water in line 116 of Grasso ‘259 somehow is injected directly into the oxidant stream in an inlet plenum of that reference, yet such is simply not the case. The water in line 116 is delivered directly to the fine pore enthalpy exchange barrier¹², and is not instead or additionally injected into the oxidant stream at that position. Nothing in the reference supports that interpretation, and it is not fact.

Beginning at page 7 of the Office Action, the Examiner first relies upon the newly-cited Grasso ‘505 reference in combination with the Grasso ‘259 reference to support an obviousness rejection of at least claim 1. Applicants respectfully traverse such rejection for the several following reasons.

Firstly, assuming *arguendo* that Grasso ‘505 were available as a reference, there is absolutely no basis or teaching to combine the water injection mechanism of Grasso ‘505, with the basic system of Grasso ‘259. The present invention and the Grasso ‘259 reference are principally concerned, at least in the broadest sense, with mass and thermal energy transfer between the exhaust and inlet air streams, as well as regulation of the humidity in the incoming air stream and at the enthalpy exchange barrier to prevent dry-out. On the other hand, the reason for the inclusion of the water injection system in the Grasso ‘505 reference is to provide water to aid in dissolving sulfur entrained in the incoming air stream. Moreover, the inclusion of that feature in Grasso ‘505 is simply an optional addition to the basic invention of scrubbing sulfur contaminants from the incoming air using an accumulator/degasifier, which cleansed air is then supplied to the fuel processor for a fuel cell power plant. Use of a water injector to dissolve sulfur from inlet air is not a teaching of using a water injector to control inlet air humidity and prevent dry-out of the enthalpy exchange barrier.

Secondly, to the extent the aforementioned Declaration of Attribution under 37 CFR 1.132 may obviate use of Grasso ‘505 as a reference, the rejection using that reference is obviated.

Statement of Common Ownership to Exclude Grasso '505 as 35 USC 103(c) Prior

Art

Thirdly, and most importantly, Applicants' attorney herewith states that the present application and the Grasso '505 reference (issued on Dec. 27, 2005) were, at the time the present invention was made, owned by, and/or subject to an obligation of assignment to, the same person or entity. Specifically, at the time of the present invention (as well as at the time of the invention in Grasso '505), the various inventors were all employees of, and under an obligation to assign and did assign these inventions to, UTC Fuel Cells, LLC (successor to International Fuel Cells, by name change), the same owner of the Grasso '505 patent then and now. In support of this statement, copies of the respective assignment recordation documents are appended hereto, with the assignment for Grasso '505 having been recorded at Reel 014174, Frame 0438, and the assignment for the present application having been recorded at Reel 014755, Frame 0047. Accordingly, Grasso '505 should be excluded from use or inclusion in any rejection of the present invention under 35 USC 103(c).

Item # 6, Pages 8-12

Claims 1-5 and 9-11 have been rejected under 35 USC 103(a) as being unpatentably obvious over Grasso et al 5,274,259 (herein after "Grasso '259") in view of Herd et al 2003/0116654 (hereinafter "Herd"). The following arguments and/or submissions with respect to Herd are believed to be timely in view of the fact that this is the first time the Herd reference has been cited/applied herein.

Firstly, with respect to the Grasso '259 reference, the Examiner has applied it in the identical manner as earlier in the Office Action, and Applicants respectfully repeat, through incorporation by reference, their analysis of that reference as previously stated herein, which is also substantially the same as expressed in Applicant's Amendment of Feb. 21, 2006. There is simply no teaching in Grasso '259 of injecting water "substantially directly" into the process oxidant stream "preparatory to the process oxidant passing through the energy recovery device..". The present invention provides that capability for the purpose of "regulating the transfer of mass and heat between the fuel cell exhaust stream and the process oxidant stream".

With respect to the Herd reference, it does disclose the use of water injectors in a fuel cell control system for injecting water into various gas streams, including the air gas stream and a heat exchanger. On the other hand, its principal focus is on the efficient utilization of multiple water injectors with respective, individually-controlled control valves. The Grasso '259 reference is concerned with the use of a fine pore enthalpy exchange barrier in an ERD, and the use of water within that barrier as a medium for water and heat exchange from the exhaust stream exiting the fuel cell plant into the process oxidant inlet stream to regulate the heat and moisture content of the oxidant stream as it enters the plant. One must query what in the Grasso '259 reference would prompt one of ordinary skill in the art to first consider the use of supplemental means for adding water to the inlet oxidant stream preparatory to that stream passing through an ERD, and next, what then would cause one to look to the Herd reference as a solution to that problem when the Herd reference contains no teaching of using an ERD with an enthalpy exchange barrier. The Herd reference only mentions use of water injectors to prevent a membrane in the fuel cell itself from drying out, but contains no mention of a fine pore enthalpy exchange barrier in an ERD external to the fuel cell, and no mention of liquid being injected into the oxidant stream "preparatory to the process oxidant passing through the energy recovery device second gas flow channel (42) for regulating the transfer of mass and heat between the fuel cell exhaust stream (48) and the process oxidant stream (53, 42)", as required in claims 1 and 11 of the present application. Thus, it is not seen how or why one would look to the Herd reference for a solution to the limitation in the Grasso '259 system that applicants have both recognized and solved with the present invention.

Declaration Under 37 CFR 1.131 – Swearing Back of Herd Reference

Further to the foregoing arguments, applicants are also submitting herewith by separate document, a **Declaration under 37 CFR 1.131** swearing back of the Herd reference. That Declaration is made by joint inventors Grasso and Dufner. The remaining joint inventor, Benjamin Nuttall, is no longer employed by the assignee, UTC Fuel Cells, LLC, and efforts to determine his whereabouts and contact him were unsuccessful (See MPEP 715.04, section I, latter portion of final paragraph ... "a joint inventor ... is otherwise unavailable").

The 131 Declaration contains a single exhibit, **Exhibit A**, which is a copy of the invention disclosure submitted to the Law Department of UTC Fuel Cells, LLC prior to Dec. 21, 2001, the “critical date” of the Herd reference. The invention disclosure of **Exhibit A** is a true and exact copy of the original disclosure document, except that precise dates, all of which pre-date the critical date, have been redacted, as is permissible. The original disclosure document with those dates will be retained in the event it is ever necessary to “prove” those dates. Moreover, although the name and signature of joint inventor Dufner were not on the original disclosure document, applicants’ attorney determined during the preparation of the present application that Mr. Dufner had made inventive contributions to the claimed invention, and that he should be included as a joint inventor. Still further, while the **Exhibit A** is clear evidence of the conception of the claimed invention in its broadest aspects prior to the critical date, it is respectfully submitted that it also effectively comprises a reduction to practice of the invention in those broadest aspects. This is due to the fact that, at least with respect to the invention recited in the broadest claims 1 and 11, once one of ordinary skill in the art was in possession of the disclosure contained in the disclosure document of **Exhibit A**, its “workability” or operability is readily ascertainable and little or no further experimentation would be required.

Item #7, Pages 12-14

Claims 6-7 and 12-17 have been rejected under 35 USC 103(a) as being unpatentable over :a) Grasso ‘259 in view of Grasso ‘505 and/or b) Grasso ‘259 in view of Herd “as applied to claims 1 and 11 above”, and further in view of Dickman et al (hereinafter “Dickman”). With the exception that the Grasso ‘505 and the Herd references are now included, the Examiner’s comments with respect to these rejections are identical to those contained in the earlier Office Action.

Applicants’ arguments regarding the applicability/inapplicability of the Grasso ‘259 and ‘505 references, and the Herd reference are incorporated here for the reasons above, and the rejections based on those references are believed to be overcome for the reasons stated earlier. Further still, applicants wish to reiterate their comments regarding the

limitations/inapplicability of the Dickman reference in rejecting these relatively specific claims.

While the Dickman reference does disclose “a control system 90 including a controller 92 that directs operation responsive to programmed instructions and/inputs from sensors and user inputs”, the limitations of the rejected claims are far more specific than that. The rejection of the present Office Action further states that the Dickman “controller 92 communicates with a sensor assembly 94 that monitors such variables as the temperature and fluid level in vessel 86”, and then proceeds to give greater detail of the nature of the Dickman control. Although the Examiner’s characterization of what the Dickman reference may disclose in the context of that particular system may be accurate, it certainly does not disclose or teach the control structure and technique claimed in the present application. For starters, applicants fail to find any mention in Dickman of a process oxidant stream for supplying process oxidant to a fuel cell for electrochemical reaction therewithin, yet it is that stream into which liquid/water is injected by the present invention under the direction of the present control scheme to achieve desired humidification conditions in portions of the system. The Dickman reference is concerned with the regulation of temperatures and flows of fluids associated with a heat reservoir 32. That is simply not the concern or objective of the present invention. Rather, claims 6-8 and 12-17 are concerned with controlling the timing/amount and/or temperature of liquid/water being injected into the process oxidant stream preparatory to that stream passing through the ERD (32) and by the barrier (46). Moreover, some of those claims are further limited with respect to sensing the temperature and/or humidity of the ambient process oxidant to effect the requisite regulation of the process oxidant stream. Nowhere in the Dickman reference is there such teaching. With respect to claim 14 and the narrow temperature range of the process oxidant stream that establishes the threshold above which water is injected into the stream, the Dickman reference simply contains no teaching. The mention in Dickman, at Col. 7, lines 28-34, of water being heated from 50⁰ to 115⁰ simply is not a teaching of injecting water into the process oxidant stream when the temperature of that stream exceeds a temperature in the limited range of about 85⁰ – 90⁰ F.

Item #8, Page 15

Finally, claims 7-8 have been rejected under 35 USC 103(a) based on a lengthy combination of purported references. In the present instance, the Examiner has added a **fourth (4th)** reference, Balasubramanian et al (hereinafter “Balasubramanian”) to the preceding combination of Grasso/Grasso/Dickman or Grasso/Herd/ Dickman.

Firstly, Applicants’ arguments regarding the applicability/inapplicability of the Grasso ‘259 and ‘505 references, and the Herd and the Dickman references are incorporated here for the reasons above, and the rejections based on those references are believed to be overcome for the reasons stated earlier. Secondly, the Balasubramanian reference appears to have been included in an attempt to suggest the obviousness of using temperature and humidity sensors to sense the temperature and humidity of the process oxidant (for use in controlling injection of water into the process oxidant). Yet reference to the cited language in Col 4, lines 14-25 of Balasubramanian appears to disclose only the monitoring of such characteristics of undisclosed media in order to regulate fuel cell temperature. This disclosure in Balasubramanian fails to bridge the gaps discussed above.

Brief Summary

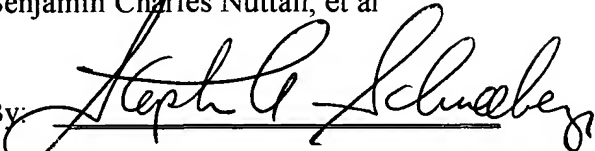
Applicants have again submitted arguments similar to those contained in the prior Amendments, at least with respect to the Grasso ‘259, Dickman, and Balasubramanian references previously cited. With respect to the newly-cited and applied Grasso ‘505 and Herd references, applicants have submitted arguments, as well as various Declarations and/or statements to obviate usage/applicability of those references. These arguments and documents are believed to be timely in view of the newly-applied art, and their entry and consideration are respectfully requested. Moreover, the Examiner should consider the fact that the arguments contained in this and prior amendments serve, via the doctrine of estoppel, to further clearly define and limit the scope of the present invention.

In view of the foregoing comments and documents, it is respectfully submitted that all of the claims do patentably distinguish over the teachings of any references properly combinable and remaining in the prosecution. Accordingly, entry of this amendment is respectfully requested to place the claims in condition for favorable reconsideration and allowance, or in better condition for appeal. In the event the Examiner feels the

prosecution of the application may be advanced by telephone interview, he is respectfully requested to contact applicants' attorney at the number below.

Respectfully submitted,

Benjamin Charles Nuttall, et al

By: 
Stephen A. Schneeberger (Reg. No. 25,434)

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Date: May 31, 2006



International Fuel Cells

A United Technologies Company

Invention Disclosure

Invention Disclosure Project No: C02725

Disclosure Title: Method and apparatus for saturation of fine pore graphite plates for use in an air humidification device in a fuel cell powerplant.

EXHIBIT A

Date Conceived: ###

Job No. (to which Inventor's time was charged when invention was conceived): 751601.6050, 751500.5411, 751030.4020

| Date of first sketch: | Drawing No. (if applicable): | Date of first successful test: | Job No. used for first successful test: |
|-----------------------|------------------------------|--------------------------------|---|
| <u>###</u> | | | |

Identify Printed Materials Related to this Disclosure:

First disclosure of this invention prior to preparation of this Invention Disclosure was made to the following:

| | | |
|----------------------|--------------------|------------------|
| 1) Name 1: Tom Clark | Employee (< click) | Date: <u>###</u> |
| 2) Name 2: | Employee (< click) | Date: |
| 3) Name 3: | Employee (< click) | Date: |

Nature and date of first public disclosure of this invention:

| | |
|--------------------|-------|
| To whom/where: n/a | Date: |
|--------------------|-------|

The invention contributed to meeting the work statement requirements of Government/Customer
Contract Number: (if any) none

Specific product(s) to which invention may apply:

| |
|---|
| Product 1: Energy Recovery Device (ERD) |
| Product 2: |
| Product 3: |
| Product 4: |
| Product 5: |

Specific development to date:
none

Planned future development:
further development and testing

| First product sold (or offer of sale) incorporating this invention: | Date of first sale (or offer) incorporating this invention: |
|---|---|
|---|---|

| Inventor Name(s): (Full Name, Ex: Doe, John R.) | Telephone Extension: | Mail Stop |
|---|----------------------|-----------|
| 1) Nuttall, Benjamin | 2843 | 610 |
| 2) Grasso, Al | 2324 | 610 |
| 3) | | |
| 4) | | |
| 5) | | |
| 6) | | |
| 7) | | |
| 8) | | |
| 9) | | |



10)

Invention Description: (3 Parts)

EXHIBIT A (CONT.)

Define the Problem:

During operation of a fuel cell powerplant incorporating the use of an Energy Recovery Device (ERD), dryout of fine pore graphite plates within the ERD tends to occur at hot and dry air inlet conditions. Dryout of these plates results in crossover of fuel cell exhaust into fuel cell inlet air stream.

Problem Solution:

A water nozzle or other water dispensing device is located near or at the Air inlet to the ERD. Air entering the ERD will transport water across the graphite plates to ensure pores within the graphite plate are kept full with water. Additional water not absorbed into the plates will humidify inlet air and be transported into inlet of fuel cell.

Benefits of Invention over Prior Solutions:

By preventing dryout of the graphite plates with the water nozzle, the ERD's operational temperature range is extended.

IFC Category: (click>) **Systems/Controls**

Keywords: (Check all that apply)

| Power Section | Fuel Processing | Systems/Controls | Other |
|--|---|--|---|
| <input type="checkbox"/> Membrane | <input type="checkbox"/> Reformer | <input type="checkbox"/> Thermal management | <input type="checkbox"/> Molten carbonate |
| <input type="checkbox"/> PEM | <input type="checkbox"/> Selective oxidizer | <input type="checkbox"/> Control | <input type="checkbox"/> Phosphoric Acid |
| <input type="checkbox"/> Ionomer | <input type="checkbox"/> CO | <input checked="" type="checkbox"/> Humidity | <input type="checkbox"/> Solid oxide |
| <input type="checkbox"/> Catalyst | <input type="checkbox"/> Carbon | <input type="checkbox"/> Reformate | <input type="checkbox"/> Base cell |
| <input type="checkbox"/> Catalyst support | <input type="checkbox"/> Gasoline | <input type="checkbox"/> Water management | |
| <input type="checkbox"/> Electrode | <input type="checkbox"/> Sulfur | <input checked="" type="checkbox"/> ERD | |
| <input type="checkbox"/> Cell | <input type="checkbox"/> Shift converter | <input type="checkbox"/> Deaerator | |
| <input type="checkbox"/> MEA | <input type="checkbox"/> Foam | <input type="checkbox"/> Pressurized | |
| <input type="checkbox"/> Diffusion Layer | <input type="checkbox"/> LTSC | <input type="checkbox"/> Start up | |
| <input type="checkbox"/> Bilayer | <input type="checkbox"/> Desulfurizer | <input type="checkbox"/> Shutdown | |
| <input type="checkbox"/> Substrate | <input type="checkbox"/> Autothermal | <input type="checkbox"/> Enthalpy wheel | |
| <input type="checkbox"/> Flowfields | <input type="checkbox"/> Methanol | <input type="checkbox"/> Vehicle | |
| <input type="checkbox"/> Flow configurations | <input type="checkbox"/> Hydrocarbon | <input type="checkbox"/> HEX | |
| <input type="checkbox"/> Separator plate | <input type="checkbox"/> Oxygenates | <input type="checkbox"/> Air | |
| <input type="checkbox"/> WTP | <input type="checkbox"/> ATR | <input type="checkbox"/> Reactant | |
| <input type="checkbox"/> Coolers | <input type="checkbox"/> Poison | <input type="checkbox"/> CSA | |
| <input type="checkbox"/> Coolants | <input type="checkbox"/> Exhaust | <input type="checkbox"/> Preheater | |
| <input type="checkbox"/> Antifreeze | <input type="checkbox"/> Burner | <input type="checkbox"/> Saturator | |
| <input type="checkbox"/> Manifolds | <input type="checkbox"/> Scrubber | | |
| <input type="checkbox"/> End plates | <input type="checkbox"/> Design | | |
| <input type="checkbox"/> Non-repeat hardware | <input type="checkbox"/> Ammonia | | |
| <input type="checkbox"/> Pressure plates | <input type="checkbox"/> Alumina | | |
| <input type="checkbox"/> Corrosion | <input type="checkbox"/> Vaporizer | | |
| <input type="checkbox"/> Seals | <input type="checkbox"/> Burner gas | | |
| <input type="checkbox"/> Sealants | <input type="checkbox"/> Adiabatic | | |
| <input type="checkbox"/> Freeze | <input type="checkbox"/> Carbon deposition | | |
| <input type="checkbox"/> Shutdown | <input type="checkbox"/> Mixer | | |
| <input type="checkbox"/> Start up | <input type="checkbox"/> Partial oxidation | | |
| <input type="checkbox"/> Potential control | <input type="checkbox"/> CPOX | | |
| <input type="checkbox"/> Performance | <input type="checkbox"/> POX | | |
| <input type="checkbox"/> Performance decay | | | |



International Fuel Cells

A United Technologies Company

Invention Disclosure

Invention Disclosure Project No: C 02725

- ☐ Electrolyte
- ☐ CSA
- ☐ Stack
- ☐ Edge Seal
- ☐ Graphite
- ☐ Fiber
- ☐ Nafion

EXHIBIT A (cont.)

Inventor(s):

(for printed copy)

| | |
|-----------------------------------|----------------------|
| Signature: <u>Benjamin Nutter</u> | Date: <u>1/11/01</u> |
| Signature: <u>[Signature]</u> | Date: <u>1/11/01</u> |
| Signature: _____ | Date: _____ |
| Signature: _____ | Date: _____ |
| Signature: _____ | Date: _____ |
| Signature: _____ | Date: _____ |
| Signature: _____ | Date: _____ |
| Signature: _____ | Date: _____ |
| Signature: _____ | Date: _____ |
| Signature: _____ | Date: _____ |

Explained to and understood by:

(for printed copy)

| | |
|-----------------------------------|----------------------|
| Signature: <u>Thomas J. Blunt</u> | Date: <u>1/11/01</u> |
| Signature: <u>[Signature]</u> | Date: <u>1/11/01</u> |



International Fuel Cells

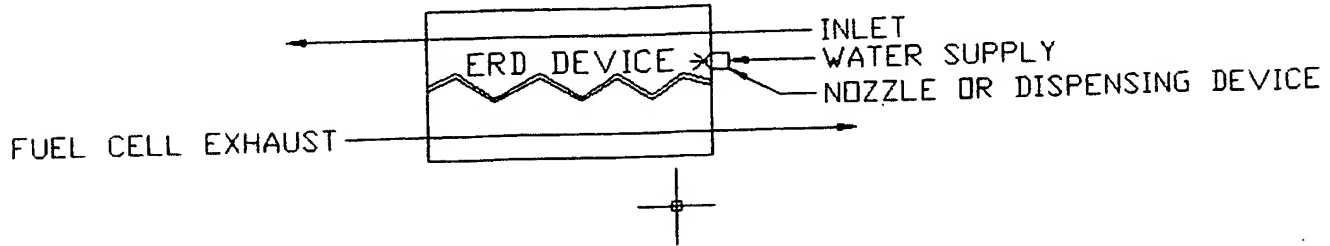
A United Technologies Company

Invention Disclosure

Invention Disclosure Project No: C02725

INSERT FIGURES HERE

EXHIBIT A (con)





DEC 9 2003

C-3703

UNITED STATES PATENT AND TRADEMARK OFFICE

UNDER SECRETARY OF COMMERCE FOR INTELLECTUAL PROPERTY AND
DIRECTOR OF THE UNITED STATES PATENT AND TRADEMARK OFFICE

DECEMBER 04, 2003

PTAS



102477942A

UTC FUEL CELLS, LLC
ROBERT H. KELLY
MAIL STOP 601-03
195 GOVERNOR'S HIGHWAY
SOUTH WINDSOR, CT 06074UNITED STATES PATENT AND TRADEMARK OFFICE
NOTICE OF RECORDATION OF ASSIGNMENT DOCUMENT

THE ENCLOSED DOCUMENT HAS BEEN RECORDED BY THE ASSIGNMENT DIVISION OF THE U.S. PATENT AND TRADEMARK OFFICE. A COMPLETE MICROFILM COPY IS AVAILABLE AT THE ASSIGNMENT SEARCH ROOM ON THE REEL AND FRAME NUMBER REFERENCED BELOW.

PLEASE REVIEW ALL INFORMATION CONTAINED ON THIS NOTICE. THE INFORMATION CONTAINED ON THIS RECORDATION NOTICE REFLECTS THE DATA PRESENT IN THE PATENT AND TRADEMARK ASSIGNMENT SYSTEM. IF YOU SHOULD FIND ANY ERRORS OR HAVE QUESTIONS CONCERNING THIS NOTICE, YOU MAY CONTACT THE EMPLOYEE WHOSE NAME APPEARS ON THIS NOTICE AT 703-308-9723. PLEASE SEND REQUEST FOR CORRECTION TO: U.S. PATENT AND TRADEMARK OFFICE, ASSIGNMENT DIVISION, BOX ASSIGNMENTS, CG-4, 1213 JEFFERSON DAVIS HWY, SUITE 320, WASHINGTON, D.C. 20231.

RECORDATION DATE: 06/09/2003

REEL/FRAME: 014174/0438
NUMBER OF PAGES: 4

BRIEF: ASSIGNMENT OF ASSIGNOR'S INTEREST (SEE DOCUMENT FOR DETAILS).

ASSIGNOR:
GRASSO, ALBERT P.

DOC DATE: 06/04/2003

ASSIGNOR:
DUFNER, BRYAN F.

DOC DATE: 06/05/2003

ASSIGNOR:
FILES, JAY C.

DOC DATE: 06/06/2003

ASSIGNOR:
PRESTON, JR., JOHN L.

DOC DATE: 06/09/2003

ASSIGNEE:
UTC FUEL CELLS, LLC
195 GOVERNOR'S HIGHWAY
SOUTH WINDSOR, CONNECTICUT 06074

SERIAL NUMBER: 10458706

FILING DATE: 06/09/2003

PATENT NUMBER:

ISSUE DATE:

014174/0438 PAGE 2

VIOLET MCCOY, EXAMINER
ASSIGNMENT DIVISION
OFFICE OF PUBLIC RECORDS

06-19-2003



Tab settings → → → ▼ ▼

To the Honorable Commissioner of Patents and Trademarks 102477942

Attached original documents or copy thereof.

1. Name of conveying party(ies):

Albert P. Grasso;
Bryan F. Dufner;
Jay C. Files; and
John L. Preston, Jr.

6-9-03

Additional names(s) of conveying party(ies)

☐ Yes ☒ No

3. Nature of conveyance:

- ☒ Assignment ☐ Merger
☐ Security Agreement ☐ Change of Name
☐ Other _____

Execution Date: June 4, 5, 6, and 9, 2003

2. Name and address of receiving party(ies):

Name: UTC Fuel Cells, LLC

Internal Address: _____

Street Address: 195 Governor's Highway

City: South Windsor State: CT ZIP: 06074

Additional name(s) & address(es) attached? ☐ Yes ☒ No

4. Application number(s) or patent numbers(s):

If this document is being filed together with a new application, the execution date of the application is: 06/4,5,6,&9/2003

A. Patent Application No.(s)

B. Patent No.(s)

(C-3103) Method
and Apparatus for
Removal of
ContaminaAdditional numbers attached? ☐ Yes ☒ No

5. Name and address of party to whom correspondence concerning document should be mailed:

Name: Robert H. Kelly

Internal Address: UTC Fuel Cells, LLC

Mail Stop 601-03

Street Address: 195 Governor's Highway

City: South Windsor State: CT ZIP: 06074

6. Total number of applications and patents involved:

1

7. Total fee (37 CFR 3.41):.....\$ 40.00

☐ Enclosed - Any excess or insufficiency should be credited or debited to deposit account☒ Authorized to be charged to deposit account

8. Deposit account number:

50-1307 (Order No. C-3103)

(Attach duplicate copy of this page if paying by deposit account)

9. Statement and signature.

To the best of my knowledge and belief, the foregoing information is true and correct and any attached copy is a true copy of the original document.

Stephen A. Schneeberger

Name of Person Signing

Signature

June 10, 2003

Date

Total number of pages including cover sheet, attachments, and document:

5

Mail documents to be recorded with required cover sheet information to:
Commissioner of Patents & Trademarks, Box Assignments
Washington, D.C. 20231

06/18/2003 6TON11 00000019 501307 10458706

01 FC:8021

40.00 DA



ASSIGNMENT

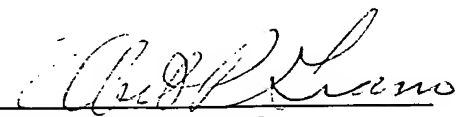
WHEREAS, We, Albert P. Grasso of Vernon, Connecticut; Bryan F. Dufner of West Hartford, Connecticut, Jay C. Files of Windsor, Connecticut, and John L. Preston, Jr. of Hebron, Connecticut, have invented certain improvements in "Method and Apparatus for Removal of Contaminants from a Hydrogen Processor Feed Stream, as in a Fuel Cell Power Plant" identified as Attorney Docket No. C-3103, and described in a patent application executed by the undersigned on the date(s) set after the signature(s) hereto, being owner(s) of all right, title and interest in and to said application and in and to any invention described therein, free from all prior assignments, agreements, licenses, mortgages, or other encumbrances whatsoever, and having full right to convey the entire interest both legal and equitable herein assigned; and

WHEREAS, UTC FUEL CELLS, LLC, of South Windsor, Connecticut, a limited liability company of the State of Delaware (assignee) is desirous of acquiring the entire right, title and interest in and to said invention or inventions and any and all patents to be obtained therefor;

NOW, THEREFORE, in consideration of One Dollar (\$1.00) and other good and valuable consideration, the receipt of which is hereby acknowledged by the undersigned, the undersigned does (do) hereby sell, assign, transfer and set over unto said assignee, its successors and assigns, the entire right, title and interest in and to said invention or inventions, as described in the aforesaid application, in any form or embodiment thereof, and in and to the aforesaid application; and in and to any application filed in any foreign country based thereon, including the right to file said foreign applications under the provisions of the International Convention; also the entire right, title and interest in and to any and all patents or reissues or extensions thereof to be obtained in this or any foreign country upon said invention or inventions and any divisional, continuation, continuation-in-part or substitute applications which may be filed upon said invention or inventions in this or any foreign country; and the undersigned hereby authorize(s) and request(s) the issuing authority to issue any and all patents on said application or applications to said assignee or its successors and assigns.

The undersigned further agree(s), without any further payment or compensation by said assignee or its successors and assigns, to communicate to said assignee, its representatives or agents or its successors and assigns, any facts relating to said invention or inventions including evidence for interference purposes or for other legal proceedings whenever requested; testify in any interference or other legal proceedings, whenever requested; execute and deliver, on request, all lawful papers required to make any of the foregoing provisions effective; and generally do everything possible to aid said assignee, its successors or assigns and nominees to obtain and enforce proper patent protection for said invention or inventions in this or any foreign country.

IN TESTIMONY WHEREOF, the undersigned has(have) hereunto set his(their) hand(s) and seal(s) on the date after his(their) signature(s).

(L.S.) 
ALBERT P. GRASSO

June 5, 2003

(L.S.) Bryan F. Dufner
BRYAN F. DUFNER

June 9, 2003

(L.S.) Jay C. Files
JAY C. FILES

June 6, 2003

(L.S.) John L. Preston, Jr.
JOHN L. PRESTON, JR.

June 4, 2003

State of Connecticut) ss: South Windsor
County of Hartford)

On this 5th day of June, 2003 before me personally appeared
ALBERT P. GRASSO to me personally known, and known to me to be the person(s) who signed
the foregoing assignment, and acknowledged the signing of same as his(their) free act and deed.

Darlene S. Sutton
Notary Public

DARLENE S. SUTTON
NOTARY PUBLIC

SEAL

My Commission Expires: May 31, 2007

State of Connecticut) ss: South Windsor
County of Hartford)

On this 9th day of June, 2003 before me personally appeared
BRYAN F. DUFNER to me personally known, and known to me to be the person(s) who signed
the foregoing assignment, and acknowledged the signing of same as his(their) free act and deed.

Darlene S. Sutton
Notary Public

DARLENE S. SUTTON
NOTARY PUBLIC

SEAL

My Commission Expires: May 31, 2007

State of Connecticut
County of Hartford)

ss: South Windsor

On this 6th day of June, 2003 before me personally appeared JAY C. FILES to me personally known, and known to me to be the person(s) who signed the foregoing assignment, and acknowledged the signing of same as his(their) free act and deed.

Darlene S. Sutton

Notary Public

DARLENE S. SUTTON
NOTARY PUBLIC

S E A L

My Commission Expires May 31, 2007

State of ~~Hart~~ Connecticut)
County of Hartford)

ss: South Windsor

On this 4th day of June, 2003 before me personally appeared JOHN L. PRESTON, JR. to me personally known, and known to me to be the person(s) who signed the foregoing assignment, and acknowledged the signing of same as his(their) free act and deed.

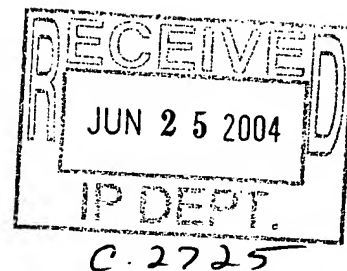
Darlene S. Sutton

Notary Public

DARLENE S. SUTTON
NOTARY PUBLIC

S E A L

My Commission Expires May 31, 2007



UNITED STATES PATENT AND TRADEMARK OFFICE

UNDER SECRETARY OF COMMERCE FOR INTELLECTUAL PROPERTY AND
DIRECTOR OF THE UNITED STATES PATENT AND TRADEMARK OFFICE

JUNE 21, 2004

PTAS



102618189A

UTC FUEL CELLS, LLC
ROBERT H. KELLY
195 GOVERNOR'S HIGHWAY
MAIL STOP 601-03
SOUTH WINDSOR, CT 06074

UNITED STATES PATENT AND TRADEMARK OFFICE
NOTICE OF RECORDATION OF ASSIGNMENT DOCUMENT

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RECORDATION DATE: 11/26/2003

REEL/FRAME: 014755/0047
NUMBER OF PAGES: 4

BRIEF: ASSIGNMENT OF ASSIGNOR'S INTEREST (SEE DOCUMENT FOR DETAILS).

ASSIGNOR:

NUTTALL, BENJAMIN CHARLES

DOC DATE: 11/18/2003

ASSIGNOR:

DUFFNER, BRYAN F.

DOC DATE: 11/20/2003

ASSIGNOR:

GRASSO, ALBERT P.

DOC DATE: 11/25/2003

ASSIGNEE:

UTC FUELL CELLS, LLC
195 GOVERNOR'S HIGHWAY
SOUTH WINDSOR, CONNECTICUT 06074

014755/0047 PAGE 2

SERIAL NUMBER: 10723502

FILING DATE: 11/26/2003

PATENT NUMBER:

ISSUE DATE:

TITLE: METHOD AND APPARATUS FOR HUMIDIFICATION CONTROL OF AN ENERGY
RECOVERY DEVICE IN A FUEL CELL POWER PLANT

VIOLET MCCOY, EXAMINER
ASSIGNMENT DIVISION
OFFICE OF PUBLIC RECORDS

RE

12-09-2003

Document No.: C-2725 Page 1 of 1

U.S. DEPARTMENT OF COMMERCE
Patent and Trademark Office

Tab settings → → → ▼



102618189

To the Director of the United States Patent and Trademark Office: Please record the attached original documents or copy thereof.

1. Name of conveying party(ies):

**Benjamin Charles Nuttall;
Bryan F. Duffner; and
Albert P. Grasso**

Additional names(s) of conveying party(ies)

☐ Yes ☒ No

3. Nature of conveyance:

☒ Assignment

☐ Merger

☐ Security Agreement

☐ Change of Name

☐ Other

Execution Date: Nov. 18, 20, and 25, 2003

2. Name and address of receiving party(ies):

Name: UTC Fuel Cells, LLC

Internal Address: _____

Street Address: 195 Governor's Highway

City: South Windsor

State: CT

ZIP: 06074

Additional name(s) & address(es) attached? ☐ Yes ☒ No

4. Application number(s) or patent numbers(s): 10723502

If this document is being filed together with a new application, the execution date of the application is: Nov. 18, 20, and 25,

A. Patent Application No.(s)

B. Patent No.(s)

**(C-2725) Method
and Apparatus for
Humidification
Contr**

Additional numbers attached? ☐ Yes ☒ No

5. Name and address of party to whom correspondence concerning document should be mailed:

Name: Robert H. Kelly

Internal Address: UTC Fuel Cells, LLC

Mail Stop 601-03

Street Address: 195 Governor's Highway

City: South Windsor State: CT ZIP: 06074

6. Total number of applications and patents involved: 1

7. Total fee (37 CFR 3.41):.....\$ 40.00

☐ Enclosed - Any excess or insufficiency should be credited or debited to deposit account

☒ Authorized to be charged to deposit account

8. Deposit account number:

50-1307 (Order No. C-2725)

(Attach duplicate copy of this page if paying by deposit account)

DO NOT USE THIS SPACE

9. Statement and signature.

To the best of my knowledge and belief, the foregoing information is true and correct and any attached copy is a true copy of the original document.

Stephen A. Schneeberger

Name of Person Signing

Signature

Nov. 26, 2003

Date

Total number of pages including cover sheet, attachments, and document: 5

Mail documents to be recorded with required cover sheet information to:

Mail Stop Assignment Recordation Services

Director of the United States Patent and Trademark Office, P.O. Box 1450, Alexandria, VA 22313-1450

12/08/2003 GT0N11 00000069 501307 10723502

01 FC:8021

40.00 DA

ASSIGNMENT

WHEREAS, We, Benjamin Charles Nuttall of Bloomfield, Connecticut, Bryan F. Dufner of West Hartford, Connecticut, and Albert P. Grasso of Vernon, Connecticut, have invented certain improvements in "Method and Apparatus for Humidification Control of an Energy Recovery Device in a Fuel Cell Power Plant" identified as Attorney Docket No. C-2725, and described in a patent application executed by the undersigned on the date(s) set after the signature(s) hereto, being owner(s) of all right, title and interest in and to said application and in and to any invention described therein, free from all prior assignments, agreements, licenses, mortgages, or other encumbrances whatsoever, and having full right to convey the entire interest both legal and equitable herein assigned; and

WHEREAS, UTC FUEL CELLS, LLC, of South Windsor, Connecticut, a limited liability company of the State of Delaware (assignee) is desirous of acquiring the entire right, title and interest in and to said invention or inventions and any and all patents to be obtained therefor;

NOW, THEREFORE, in consideration of One Dollar (\$1.00) and other good and valuable consideration, the receipt of which is hereby acknowledged by the undersigned, the undersigned does (do) hereby sell, assign, transfer and set over unto said assignee, its successors and assigns, the entire right, title and interest in and to said invention or inventions, as described in the aforesaid application, in any form or embodiment thereof, and in and to the aforesaid application; and in and to any application filed in any foreign country based thereon, including the right to file said foreign applications under the provisions of the International Convention; also the entire right, title and interest in and to any and all patents or reissues or extensions thereof to be obtained in this or any foreign country upon said invention or inventions and any divisional, continuation, continuation-in-part or substitute applications which may be filed upon said invention or inventions in this or any foreign country; and the undersigned hereby authorize(s) and request(s) the issuing authority to issue any and all patents on said application or applications to said assignee or its successors and assigns.

The undersigned further agree(s), without any further payment or compensation by said assignee or its successors and assigns, to communicate to said assignee, its representatives or agents or its successors and assigns, any facts relating to said invention or inventions including evidence for interference purposes or for other legal proceedings whenever requested; testify in any interference or other legal proceedings, whenever requested; execute and deliver, on request, all lawful papers required to make any of the foregoing provisions effective; and generally do everything possible to aid said assignee, its successors or assigns and nominees to obtain and enforce proper patent protection for said invention or inventions in this or any foreign country.

IN TESTIMONY WHEREOF, the undersigned has(have) hereunto set his(their) hand(s) and seal(s) on the date after his(their) signature(s).

(L.S.) Benjamin Nuttall
BENJAMIN CHARLES NUTTALL

November 18, 2003

(L.S.) Bryan F. Dufner
BRYAN F. DUFNER

Nov. 20, 2003

(L.S.) Albert P. Grasso
ALBERT P. GRASSO

Nov 25, 2003

State of Connecticut) ss: South Windsor
County of Hartford)

On this 18th day of November, 2003 before me personally appeared BENJAMIN CHARLES NUTTALL to me personally known, and known to me to be the person(s) who signed the foregoing assignment, and acknowledged the signing of same as his(their) free act and deed.

Darlene S. Sutton
Notary Public

DARLENE S. SUTTON
NOTARY PUBLIC

SEAL

My Commission Expires May 31, 2007

State of Connecticut) ss: South Windsor
County of Hartford)

On this 20th day of November, 2003 before me personally appeared BRYAN F. DUFNER to me personally known, and known to me to be the person(s) who signed the foregoing assignment, and acknowledged the signing of same as his(their) free act and deed.

Darlene S. Sutton
Notary Public

DARLENE S. SUTTON
NOTARY PUBLIC

SEAL

My Commission Expires May 31, 2007

Page Three

Attorney Docket No. C-2725

State of Connecticut
County of Hartford)

) ss: South Windsor

On this 25th day of November, 2003 before me personally appeared ALBERT P. GRASSO to me personally known, and known to me to be the person(s) who signed the foregoing assignment, and acknowledged the signing of same as his(their) free act and deed.

Darlene S. Sutton
Notary Public

DARLENE S. SUTTON
NOTARY PUBLIC

S E A L

My Commission Expires: May 31, 2007
~~My Commission Expires~~